

Appl. No.: 10/049,330  
Group Art Unit: 1621  
Applicants' Reply to the Office Action dated May 6, 2004

#### REMARKS

Claims 10-35 are currently pending in the present application.

In the Office Action, the Examiner rejects claims 15 and 16 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Examiner argues that the claims are indefinite because "it is unclear how the reaction mixture will come to contain the polymerization inhibitor if the surface of the reaction zone which is not in contact with the reaction mixture is contacted with the third [polymerization] inhibitor." (See, the Office Action, p. 3).

Applicants respectfully traverse the Examiner's rejection and the arguments in support thereof for the following reasons. Neither claim 15 nor claim 16 requires that "the reaction mixture" must come to contain the third polymerization inhibitor. It may, but this is not required by the claim language. Claim 15 and claim 16, which depend from claims 10 and 12, respectively, are directed to the processes according to those claims wherein a third polymerization inhibitor is introduced into the reaction zone such that a portion of the inner surface of the reaction zone which is not in contact with the reaction mixture is contacted with the third polymerization inhibitor. Applicants submit that these claims, when read in light of the Specification, are clear and not indefinite.

The subject matter embodied by the language of claims 15 and 16 is thoroughly described in the Specification, for example, at page 5, lines 20-30, page 6, lines 14-19, and page 7, lines 24-28. In this regard, Applicants submit that the Specification clearly describes certain preferred embodiments of the present invention wherein polymerization inhibitor is introduced into the reaction zone such that the upper walls and/or cover, or other inner surfaces of the reaction zone not in intimate contact with the liquid reaction mixture, are contacted with the polymerization inhibitor. As explained in the above-cited portions of the Specification, this helps to prevent unwanted polymerization from occurring on these surfaces. A particularly preferred embodiment of the present invention depicted in Figure 1 of the instant application shows this by way of the arrows (which represent inhibitor) exiting nozzles (14) aimed at the reactor cover (15).

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Applicants respectfully submit that claims 15 and 16 are clear and readily understood by one of ordinary skill in the art, upon reading the Specification. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph is respectfully requested.

In the Office Action, the Examiner rejects claims 10-30 under 35 U.S.C. §103(a), as obvious over European Patent Publication No. EP 916643 of Venter, *et al.*, "as evidenced by counterpart U.S. Pat. No. 6,506,930" (hereinafter referred to as "Venter '930"), in view of U.S. Pat. No. 5,322,960 of Sakamoto, *et al.* (hereinafter referred to as "Sakamoto"). It is noted that all references in the Office Action to Venter are to Venter '930, not the European Publication. Additionally, Applicants respectfully note that while Venter '930 may be related to the European Publication, it is not clear that they are counterparts. Venter '930 is a continuation-in-part of an earlier U.S. application which appears to have published as European Patent Publication No. EP 916643. However, the extent of information present in Venter '930 which is not present in European Patent Publication No. EP 916643 has not been established.

In any event, the Examiner specifically contends that Venter '930 discloses a process which consists of (A) charging a reactor with an alcohol, a (meth)acrylic acid, a strong acid catalyst, and water, (B) reacting the mixture to form an alkyl (meth)acrylate and (C) separating the alkyl (meth)acrylate and water from the reaction mixture. The Examiner further contends that at least one inhibitor may be introduced into the reactor in step (A). Finally, the Examiner contends that a preferred embodiment described with respect to Figure 1 set forth in Venter '930, includes a distillation column situated on top of the reactor and that "the column has means for feeding . . . at least one inhibitor." (See, the Office Action, p. 6).

The Examiner acknowledges that Venter fails to teach the use of a third polymerization inhibitor. However the Examiner argues that, ". . . one of ordinary skill would expect that a polymerization in contact with the surface of the reactor would be a necessary aspect of the process . . . , and therefore, would be within the motivation of those of ordinary skill." (See, *id.* at p. 7).

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The Examiner alternatively argues that Sakamoto discloses an inhibiting composition that contains three different inhibitors, and that one of ordinary skill in the art would have been motivated to combine Sakamoto and Venter '930 to arrive at Applicants' claimed invention.

On these bases the Examiner argues that the claims are obvious. Applicants strenuously, but respectfully, traverse the Examiner's rejection and the arguments and contentions in support thereof for the following reasons.

To begin with, Applicants' claimed invention is directed to processes for producing esters wherein water of reaction is separated out from the gas/vapor phase containing the water and unreacted carboxylic acid so that a condensed acid can flow back into the reactor and the *wastewater exiting the process* contains a much lower amount of unreacted carboxylic acid. (See, Applicants' Specification, p. 4, lines 10-20). Moreover, the claimed processes prevent unwanted polymerization of the condensed, *i.e.*, concentrated, carboxylic acid by employing polymerization inhibitors at multiple points in the reaction system. The claimed processes comprise:

(a) providing a liquid reaction mixture comprising (i) an unsaturated carboxylic acid having a boiling point greater than water, (ii) a polyhydric alcohol, and (iii) a first polymerization inhibitor, in a reaction zone having an inner surface;

(b) reacting the acid and the polyhydric alcohol to form an ester, such that a gas/vapor phase is formed comprising water of reaction;

(c) removing at least a portion of the gas/vapor phase from the reaction zone to a dephlegmation zone having an inner surface;

(d) partially condensing the portion of the gas/vapor phase in the dephlegmation zone such that a condensate is formed; and

(e) returning the condensate to the reaction zone;

wherein a second polymerization inhibitor is introduced into the dephlegmation zone such that the portion of the gas/vapor phase and/or the condensate are contacted with the second polymerization inhibitor.

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In order to establish *prima facie* obviousness, and thus shift the burden of proving non-obviousness onto Applicants, the Examiner must show all of the following three criteria: (1) there must be some suggestion or motivation to modify or combine the references as suggested by the Examiner (it is not sufficient to say that the cited references can be combined or modified without a teaching in the prior art to suggest the desirability of the modification); (2) there must also be a reasonable expectation of success; and (3) the references as combined must collectively teach or suggest all limitations of the claims. The teaching or suggestion to combine and modify the cited art and the reasonable expectation of success must both be found in the prior art and not in the Applicant's Specification. (M.P.E.P. §2143).

First, neither Venter '930 or Sakamoto, nor a combination of the two, teaches or suggests each and every element of Applicants' claimed invention. Venter '930 is directed to a process for preparing alkyl (meth)acrylates wherein the *aqueous* distillate is recycled back into the reactor. (See, Venter '930, col. 2, lines 55-57). The instantly claimed invention is directed to removing water from the acid-containing gas/vapor phase, *i.e.* dephlegmation. Additionally, Venter '930 is directed to the reaction of (meth)acrylic acid and C<sub>1</sub>-C<sub>4</sub> monohydric alcohols. The instantly claimed invention is directed to the reaction of a carboxylic acid and a polyhydric alcohol. Furthermore, Venter '930 discloses the charging of an inhibitor into the reactor "in step (A)", as noted by the Examiner. It is submitted that step (A), as disclosed in Venter '930, involves the "charging of a reactor" with an alcohol, acid, catalyst, water, and optionally, a polymerization inhibitor. (See, Venter '930, col. 1, lines 61-64 & col. 3, lines 60-61). In step (B), as disclosed in Venter '930, the reaction components are reacted to form a C<sub>1</sub>-C<sub>4</sub> alkyl (meth)acrylate. (See, *id.* at col. 1, lines 64-67). The instantly claimed invention comprises the provision of a liquid reaction mixture comprising a polymerization inhibitor in a reaction zone, *and* the introduction of a polymerization inhibitor into the dephlegmation zone for direct contact with the gas/vapor phase and/or condensate produced via the reaction.

Neither Venter '930 or Sakamoto, nor a combination of the two, teaches or suggests these elements of the claimed invention. The cited references fail to teach or suggest: (i) the removal of water from an acid-containing gas/vapor phase; (ii) the reaction of a carboxylic

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acid and a polyhydric alcohol; and (iii) the provision of a liquid reaction mixture comprising a polymerization inhibitor in a reaction zone in conjunction with the introduction of a polymerization inhibitor into the dephlegmation zone for direct contact with the gas/vapor phase and/or condensate produced via the reaction.

Secondly, neither of the cited references contains any teaching or suggestion which would motivate one of ordinary skill in the art to combine the references and modify their teachings in order to arrive at Applicants' claimed invention as suggested by the Examiner. The Examiner has alleged that the disclosure in Sakamoto of an inhibitor composition containing three different inhibitor compounds would somehow motivate one of ordinary skill in the art to modify the teachings of Venter '930 to arrive at Applicants' claimed invention. Applicants respectfully disagree. At best, the combination of the two references might suggest using a three compound mixture as the single inhibitor introduced in step (A) of the process disclosed in Venter '930. Nowhere does Sakamoto suggest that a polymerization inhibitor ought to be BOTH provided in the reaction mixture in the reaction zone AND introduced into a dephlegmation zone for contact with the gas/vapor phase and/or condensate.

Given that neither reference teaches or suggests each and every element of Applicants' claimed invention, and that neither reference suggests the combination and modification of the disclosures to arrive at the claimed invention, it cannot be reasonably said that the references would provide one of ordinary skill in the art with a reasonable expectation of success in such a modification.

In view of the comments set forth above, Applicants submit that all pending claims patentably distinguish over the prior art of record and known to Applicants, either alone or in combination. Accordingly, reconsideration, withdrawal of the rejections and a Notice of Allowance for all pending claims are respectfully requested.

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Respectfully submitted,  
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(Date)

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